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Memo

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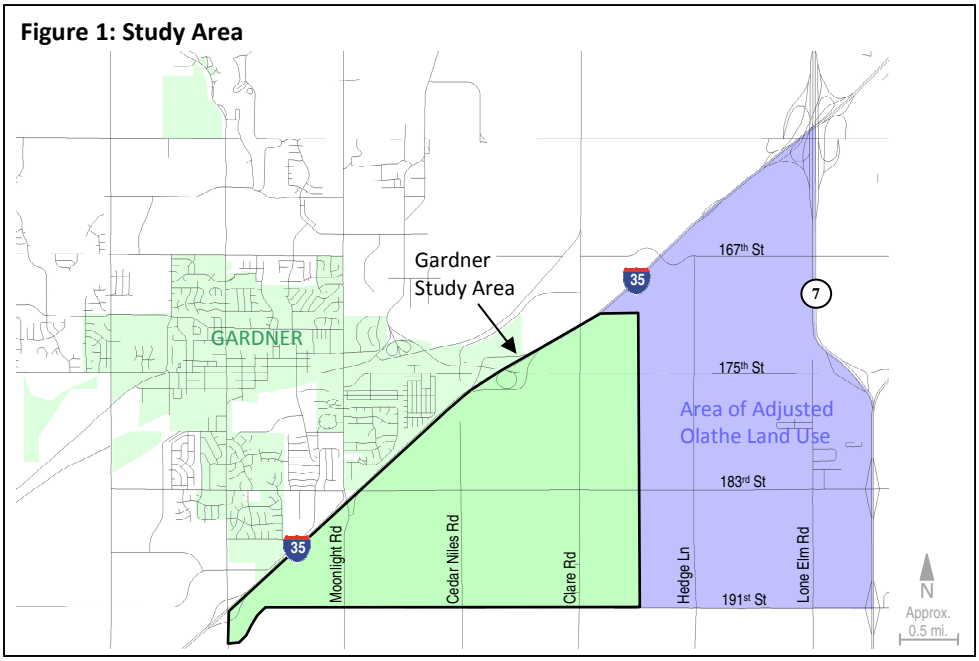
From:	Christopher Kinzel, Molly Nick, Robert Frazier	Project:	Transportation Modeling East of I-35
CC:			
Date:	3/9/11	Job No:	147754

As the City of Gardner continues to grow, it continues to examine its future transportation needs. With the expectation that growth will soon extend east of I-35, the City has requested this study to consider the future circulation and access needs in that area. The ultimate goal of this project is to develop a planning-level circulation and access concept for the study area. The analysis used future land use plans from the City of Gardner and the City of Olathe as a basis for projecting future build-out traffic volumes. The volumes were then used to study the location, type, and capacity of future arterial and collector roadways in the study area. The potential for a new I-35 interchange in the vicinity of 183rd Street was also explicitly examined.

Study Area

As shown in **Figure 1**, the Study Area for this project extends from I-35 to one half mile east of Clare Road and from 191st Street to north of 175th Street; an area of approximately 5.3 square miles. This area is similar in size to the current city limits of Gardner, and will have a significant impact on the City, once developed. In addition to the primary study area there is a secondary area to the east (located within Olathe) where future land use was modified as part of the travel demand model development process.

Figure 1: Study Area



Land Use Assumptions

HDR staff developed build-out land use assumptions for the primary Gardner study area based on current and historical City of Gardner land use plans. City staff assisted with this process and approved the final assumptions. The primary Gardner study area is within Gardner's future annexation boundary. The secondary area from a half mile east of Clare Road to K-7 lies within the ultimate boundary for the City of Olathe. Therefore, the build-out assumptions for this area were based on information provided by the City of Olathe. The 2030 land use developed for the City of Gardner Transportation Master Plan was assumed for areas located outside the triangle formed by I-35, K-7, and 191st Street (i.e. not in the primary or secondary study areas), including the remainder of the City of Gardner. **Figure 2** illustrates the final land use assumptions in the Gardner study area. **Table 2** shows the total land use assumed for both portions of the study area.

As shown in Figure 2, the land along I-35 south of the US 56 interchange is assumed to be mainly office and business park with a neighborhood commercial center near 183rd Street. Retail development is concentrated near the intersection of 175th Street and Clare Road. The remainder of the study area is comprised of mixed-use and residential land uses. As shown in **Table 1**, the Gardner study area includes over 6,000 new dwelling units, over 4 million square feet of new retail space, and over 7 million square feet of new office, warehouse, and industrial space. The new land use in the Olathe area (as shown on Figure 1) includes substantial new residential and commercial developments as well, with over 8,000 new dwelling units and over 11 million square feet of commercial space (predominantly industrial).

Figure 2: Build-Out Land Use – Gardner Annexation Area

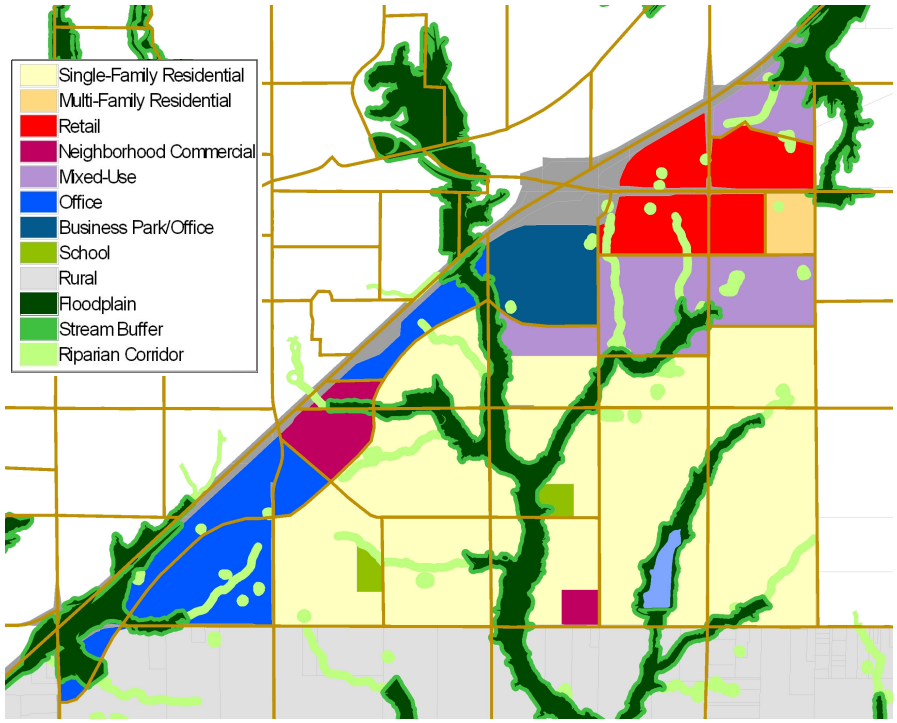


Table 1: Land Use Comparison

		Gardner Area		Olathe Area	
Land Use	Units	2030 TMP Growth	Assumed Build-out Growth	2030 TMP Growth	Assumed Build-out Growth
Single Family Residential	DUs	1,101	4,848	1,887	3,517
Multi-Family Residential	DUs	200	1,753	2,683	4,797
Retail	Sq. Ft.	373,590	4,063,456	1,022,000	1,057,106
Office	Sq. Ft.	--	7,033,375	93,343	3,694,955
Industrial	Sq. Ft.	--	874,249	4,468,800	7,146,386
Warehouse	Sq. Ft.	--	1,457,081	1,748,758	--
Hotel	Rooms	80	--	--	--
Medical	Sq. Ft.	7,000	--	--	--
School	Students	872	882	--	--
Church	Sq. Ft.	20,000	--	--	--

Notes: DUs = Dwelling Units, Sq. Ft. = Square Feet

Travel Demand Model Forecasts

The City of Olathe's Travel Demand Model was used to develop average daily traffic forecasts for the study area. The land use assumptions described above were employed for two new build-out modeling scenarios. While the land use remained constant across the two new scenarios, different highway improvement options were considered. The original Transportation Master Plan results are also included for comparison. The modeling scenarios are listed below.

- **Transportation Master Plan (2030):** This presents the final 2030 results from the Transportation Master Plan, which contained primarily low-density residential development in the study area. It is included for comparison purposes.
- **Baseline (Build-out)**: This scenario assumes the new build-out land use as well as a set of baseline roadway improvements, including a single new two-lane bridge over I-35 at 183rd Street.
- **Improved with 183rd Street Interchange (Build-out)**: In addition to the build-out landuse and baseline roadway improvements, this scenario assumes a new interchange at 183rd Street. The new northbound on-ramp and southbound off-ramp are each assumed to have two lanes. The ramp termini intersections are assumed to be multi-lane roundabouts. The scenario also includes four lanes on 183rd Street from Cedar Street to the new Frontage Road east of I-35 (including the bridge over I-35). The US-56 westbound to northbound on-ramp is also assumed to have two lanes.

The results of the above model runs are presented in **Figures 3 through 5**. These figures show the resulting volume/capacity ratios, as well as the predicted traffic demand. A number of key findings have been identified based on these traffic projections.

1. 175th Street is expected to carry in excess of 50,000 vehicles per day (vpd) in both of the build-out scenarios. This is a result of the type and intensity of land-use in the 175th Street corridor. For example, the model predicts over 40,000 daily trips will be generated by the mainly retail developments proposed near 175th Street and Clare Road. Given the proposed retail activity, the p.m. peak hour is likely to be the most congested weekday time period. Accommodating this volume of traffic will require major widening, turn lanes, and effective access management.

2. The proposed 183rd Street Interchange is forecasted to serve over 27,000 vpd (sum of the four ramp volumes) as shown on Figure 5. It would attract trips from both sides of I-35. It would also relieve traffic from both of the nearby interchanges (US-56 and Gardner Road), reducing some ramps to below the 2030 TMP projections. For example, it would reduce traffic on the ramps to and from the north at the Gardner Road interchange and the loop ramp at the US-56 interchange. It would also reduce traffic demands on US-56, Clare Road, and portions of Moonlight Road. Conversely, it would increase traffic on 183rd Street and some of the collector roadways on both sides of the interstate.

3. Clare Road is expected to have volumes of between 21,000 vpd and 28,000 vpd immediately south of 175th Street in the two build-out scenarios as illustrated in Figures 4 and 5. (The new interchange would lower the volumes at this location by 3,000 vpd.) The volumes on Clare Road would decrease further south, reaching approximately 8,500 vpd just north of 183rd Street.

4. The maximum forecasted volume on the proposed roadway that parallels I-35 from Gardner Road to Clare Road is 10,360 vpd just east of Gardner Road and 10,450 vpd just west of Clare Road in the scenario without the new interchange at 183rd Street. With the new interchange, the volumes would generally be lower, with a peak of 8,470 vpd just west of Clare Road. Overall, this roadway is forecasted to carry less than 8,000 vpd for most of its length in both build-out scenarios. It is envisioned as a collector roadway, except for the section used to connect 191st Street with Gardner Road.

5. In the scenario without a new 183rd Street interchange, 183rd Street would carry over 10,000 vpd on either side of I-35. Moonlight Road would carry 15,600 vpd north of I-35 and 10,000 vpd immediately to the south. The two-lane 183rd Street bridge itself would carry 23,500 vpd (this could increase if the bridge was assumed to be four lanes).

6. In the scenario with a new 183rd Street interchange, 183rd Street would carry 14,700 vpd to the west of the interchange and 16,100 to the east. Moonlight Road would carry 16,900 north of the interchange and 13,700 to the south. The 183rd Street bridge would carry 31,300 vpd.

Figure 3: Transportation Master Plan (2030) Forecasts
(showing projected daily traffic volumes)

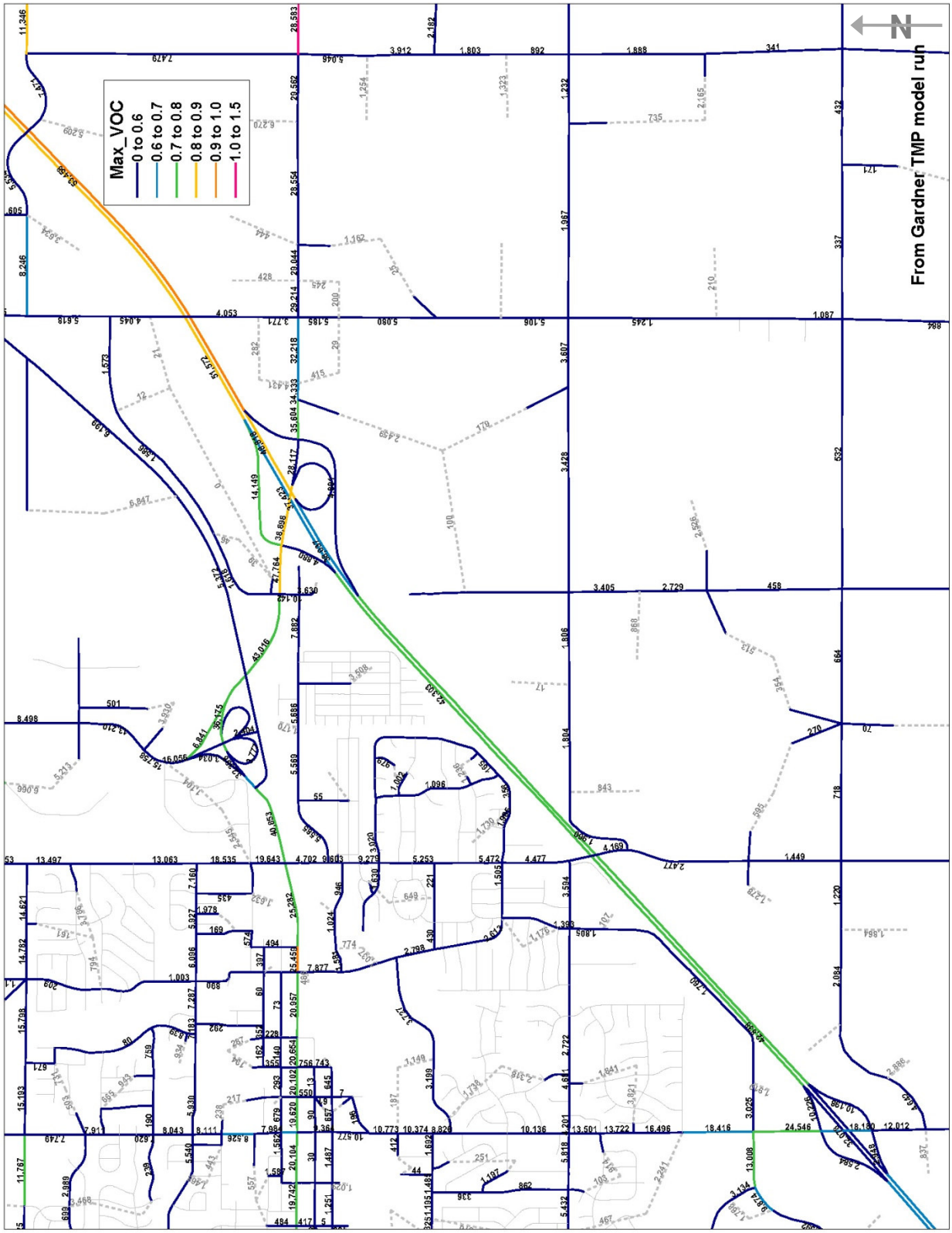


Figure 4: Baseline Build-out Forecasts
(showing projected daily traffic volumes)

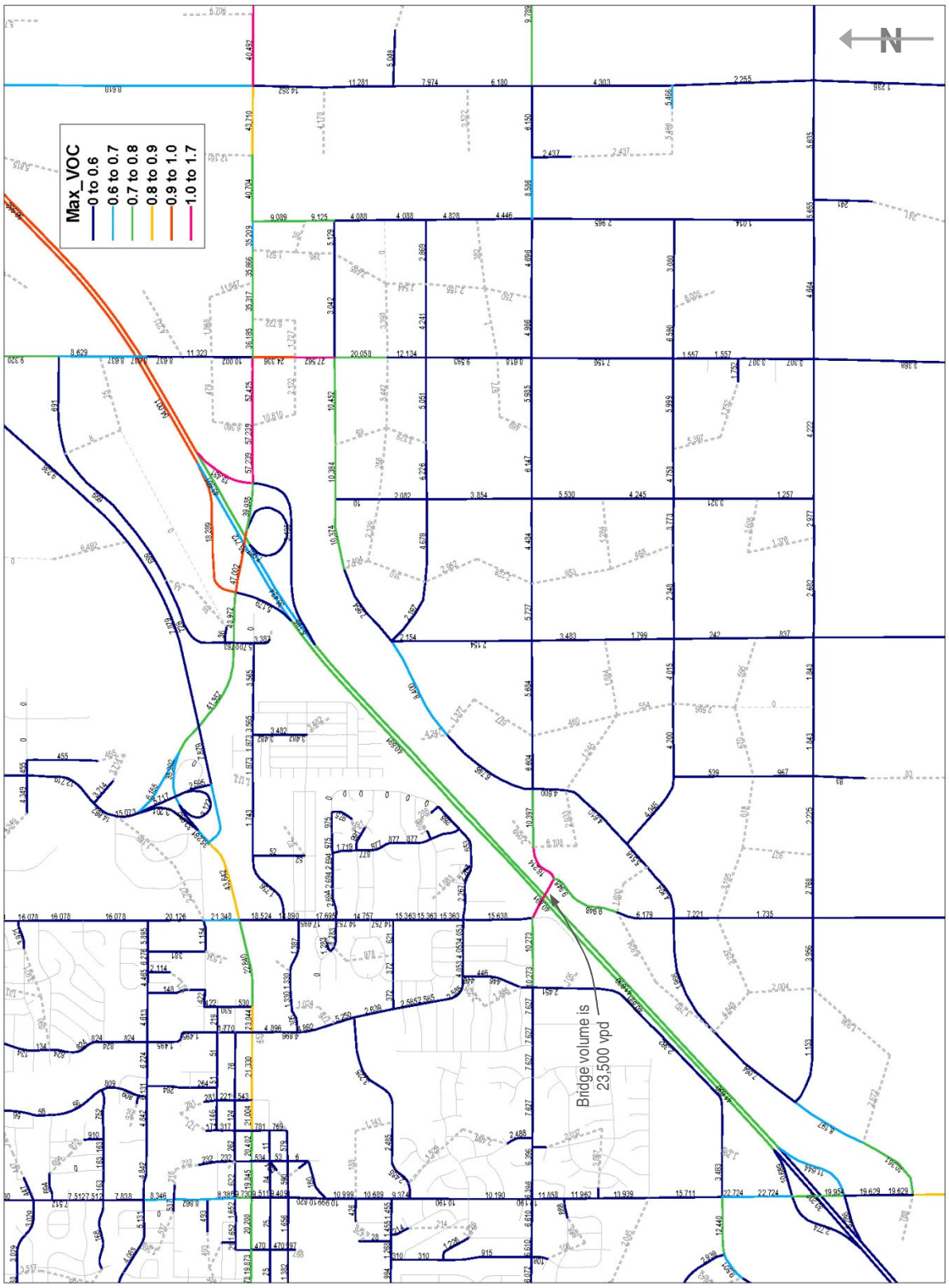
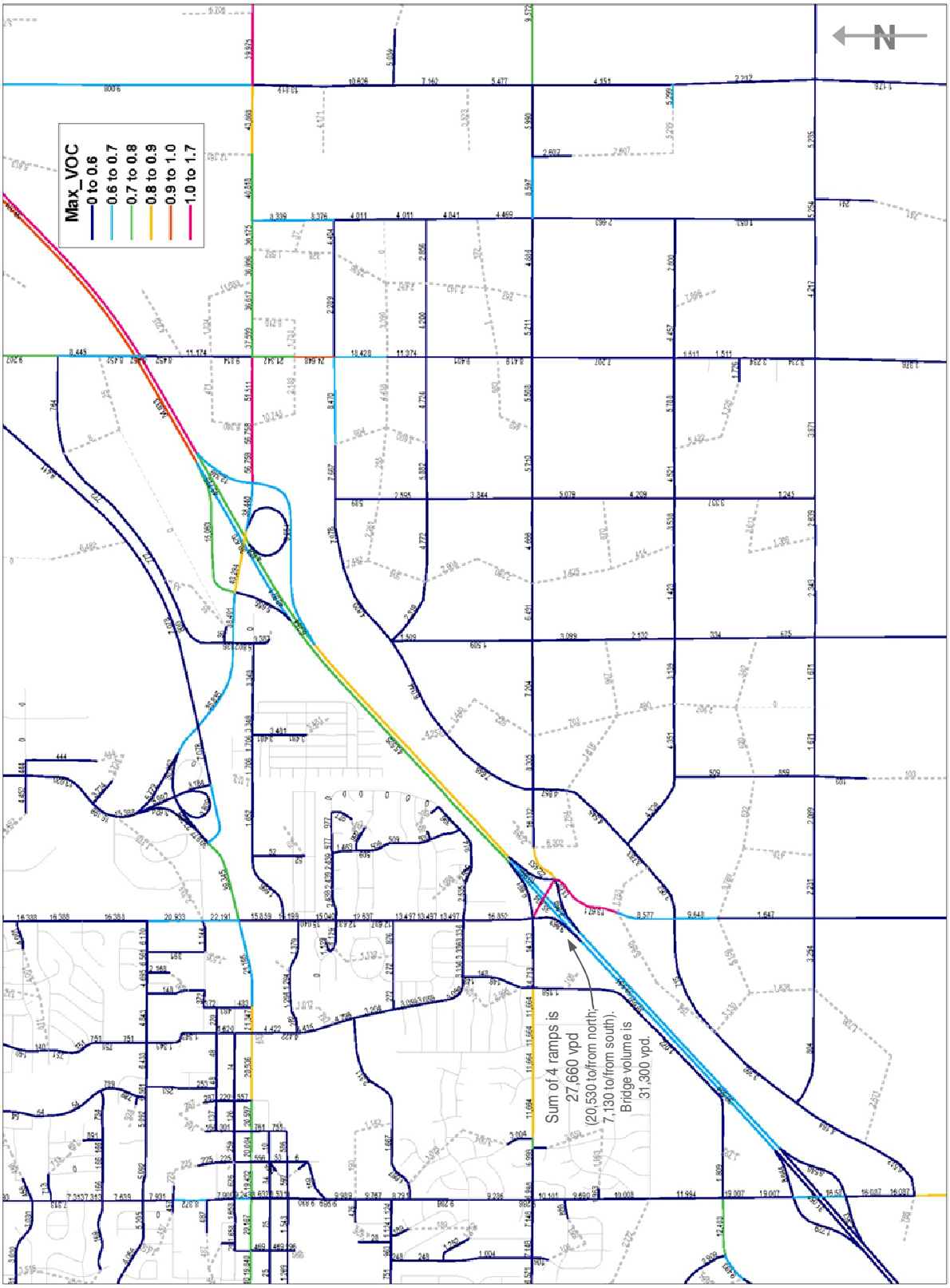


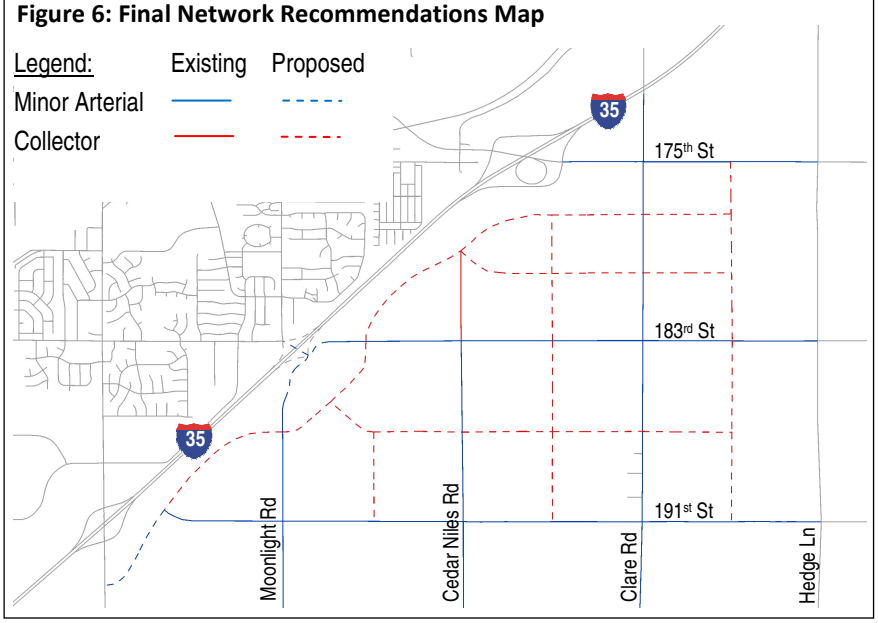
Figure 5: Improved with 183rd Street Interchange Build-out Forecasts
(showing projected daily traffic volumes)



Roadway Recommendations

In order to adequately serve the new development proposed in the land use plans, the street network shown in **Figure 6** is recommended. This roadway network is intended to provide an adequate level of local access as well as sufficient through capacity. The street layout is also designed to meet the proposed access management standards.

Figure 6: Final Network Recommendations Map



This modified grid layout includes a core of minor arterial streets supplemented by a network of collector streets. New roadways are shown in dashed lines. The one-mile section roadways are employed as minor arterials, with collectors located within each one-mile section. Moonlight Road and 183rd Street are minor arterials serving the west side of I-35. Consistent with the Transportation Master Plan, 10,000 vpd was used as the general threshold for considering additional through and/or turn lanes on a roadway.

Based on the predicted volumes, functional class, and types of development, a number of conclusions have been drawn. Roadways not specifically mentioned below are assumed to have two through lanes, though they may require turn lanes in accordance with the City's access management guidelines or the results of a traffic study.

1. 175th Street: From the I-35/US-56 interchange to Clare Road, obtain right-of-way for up to eight through lanes plus turn lanes (minimum 180 foot right-of-way). Plan to construct the roadway in phases as warranted by traffic and development. East of Clare Road, consider a six-lane section (minimum 160 foot right-of-way). Include left- and right-turn lanes at all intersections and full access points. Appropriate turn lanes could also be required at partial access connections (e.g. right-turn lanes at right-in/right-out driveways). Careful implementation of the access management guidelines will be very important to maintaining safe and efficient traffic flow on 175th Street.

2. Clare Road: Plan for four lanes from 175th Street to 183rd Street with a minimum 120-foot right-of-way (possibly more near intersections). Evaluate the need for four lanes north of 175th Street based on future development proposals. Include turn lanes at all intersections and full access points.

3. 183rd Street: Plan for an ultimate four-lane section from Cedar Street (west of I-35) through the new interchange to the new Frontage Road. Depending on the design of the intersections at either end of the bridge, additional lanes could be required. Again, include turn lanes at intersections and full access points.

4. Moonlight Road: The Transportation Master Plan proposed widening Moonlight Road from Warren Street south to 183rd Street. With new development east of I-35 and a new interchange, these improvements would become even more important (and may need to be enhanced). Similar to 183rd Street, it is important to extend this widening (3-4 lanes) south to the new Frontage Road south of I-35.

5. Frontage Road: The Frontage Road along I-35 is assumed to be a collector roadway. It would provide access to the office/commercial development along that corridor. The roadway will require turn lanes at major intersections and access points (especially near Clare Road and Gardner Road).

In addition to the above conclusions, a number of other topics and issues should be considered at a planning level. These summary comments are intended to give the city further guidance as it plans for development east of I-35.

New I-35 Interchange at 183rd Street and Moonlight Road

The proposed I-35 interchange at 183rd Street will help the City achieve the planned build-out land use goals for the area near 183rd Street and Moonlight Road, while at the same time decreasing traffic at many of the other interchange ramps in the area. In particular, it would decrease traffic demands on the US-56 to I-35 northbound loop ramp, which is a challenging ramp to improve with regard to capacity. It would also reduce demands on the Gardner Road interchange's northern ramps. Without the interchange, it is unlikely that substantial office and/or commercial development would be feasible in the vicinity of 183rd Street and Moonlight Road due to circuitous access. If possible, as part of the build-out plans for the community, the right-of-way necessary for this interchange should be preserved for the future (or potentially integrated into the design of the truck weigh station plans).

Possible Cedar Niles Road Connection Over I-35

A special test was conducted to examine the benefit of a southern extension of Cedar Niles Road across I-35. It was hoped that this connection would reduce the traffic traveling through the US-56 interchange on 175th Street. The extension would require either acquiring a portion of the Gardner Truck Plaza and/or Wal-Mart development sites. It would also require a substantial bridge (likely 350 feet long or longer). In this model scenario, the connection was projected to carry 13,600 vpd over I-35. It would decrease volumes through the US-56 interchange by approximately three to four thousand or roughly 10 percent. The bridge would improve overall circulation and access; however critical intersection upgrades would also be required, especially at Cedar Niles Road and Santa Fe Street. It could also reduce travel times between the development on the two sides of I-35 in that area. Furthermore, it would provide benefits for emergency access (especially if there was not a fire station on the east side of I-35). In general, there are a number of benefits associated with the bridge connection, but, they may not be sufficient to warrant the capital and maintenance costs (including right-of-way) of the project. However, in order not to preclude the possibility of making this connection in the future, it is recommended that right-of-way be preserved on the southeast side of I-35 along an alignment that could serve this purpose.

Impact of Different Land-Uses on Traffic Volumes and Roadway Needs

In planning the future land-uses, developments, and roadway system for the study area, it is important to consider that different land-uses generate very different traffic volumes. This difference is demonstrated in **Table 2**, which presents estimated trips generated for a 10-acre development site with different land uses. As indicated, retail developments generate the largest number of trips per acre, while single-family developments generate the fewest. Some specific uses such as fast-food and gas station

Table 2: Estimated Trips by Land Use for a 10 Acre Site

Land Use	Approx. ITE Daily Trip Rate	Density Assumptions	Est. Trips for 10 Acre Dev.
Single-Family Residential	9.57/du	3.5 du/ac	**330**
Multi-Family Residential	6.65/du	8.5 du/ac	**570**
Retail (Shopping Center)	42.94/ksf	10.2 ksf/ac	**4370**
Office	11.01/ksf	17.4 ksf/ac	**1920**
Light Industrial	6.97/ksf	13.1 ksf/ac	**910**
Mixed-Use Site*	*	**	**1600**

du = dwelling units, ac = acre, ksf = 1,000 square feet

* 20% retail, 20% office, 60% multi-family

**per acre: 2 ksf retail, 3.5 ksf office, 5.1 du

establishments generate even higher levels of traffic on a per acre (or per 1,000 square foot) basis. Mixed-use developments can mitigate the impact of the higher generating uses, by mixing them with lower generating uses. They can also encourage shorter or non-auto trips by putting homes, shops, and employment all within walking/biking distance.

The higher intensity land-uses in Table 2 would require higher levels of on and off-site traffic and roadway improvements. The specifics of what is needed would be determined by a traffic impact study.

It is important to recognize that the developers of the higher generating uses often want frequent access points. This creates a tension between the need to accommodate the high traffic volumes and the need for access. In these critical high-intensity areas, it becomes very important to follow the access management guidelines as closely as possible to prevent unacceptable congestion (which in turn hinders the economic success of the retail developments). It is also prudent to consider mixed-use developments in retail / commercial areas where the traffic volumes are projected to be over capacity. It is also useful to note that industrial, warehouse, and manufacturing tend to be low traffic generating uses (among the commercial uses).

Access Management / Access Planning

Access management in the area east of I-35 is critical to the long-term success of the roadway infrastructure. The Access Management Guidelines should be considered with every development plan. Following these guidelines will yield a safe and highly functional roadway system that best meets the needs of all stakeholders (drivers, land owners, businesses, tax payers, etc.). As part of this effort, joint access and access from collector and local roadways should be promoted and facilitated throughout the area. Care should also be taken to construct all new roads in a manner that supports the access management program. An example of a small area access plan for the area near 175th Street and Clare Road is provided at the end of this document.

Traffic Impact Studies

Given the significant new roadway infrastructure that is needed in the area, it is essential that all new developments, meeting the minimum criteria, prepare a traffic impact study (TIS). The studies should be prepared in accordance with the City's TIS guidelines. These documents will greatly assist the City in planning for adequate facilities and assigning impacts to the projects that cause them.

Right-of-Way / Project Funding

As development projects come up for approval in the planning area east of I-35, it is critical that the city obtain sufficient right-of-way for the ultimate build-out roadway system. This right-of-way width should meet or exceed the criteria in this document as well as in the Transportation Master Plan. Near intersections, it is recommended that additional right-of-way be obtained to ensure adequate width for the necessary turn lanes, utilities, and signal equipment. Detailed traffic impact studies can provide further guidance regarding exactly how much right-of-way will be needed to meet the ultimate build-out traffic needs at specific intersections.

This is also a prudent time to consider other mechanisms for funding the needed roadway infrastructure east of I-35. Specifically, a traffic impact fee system and/or a transportation development district could be considered to provide adequate, timely, and fair funding mechanisms to support the needed roadways. (Similar measures could also be applied to other infrastructure elements.)

Roadway Needs, Access Management, and Phasing near 175th Street and Clare Road

Without specific development proposals including land-uses, layouts, and phasing it is not possible to make traffic improvement recommendations with regard to individual land parcels. However, the area near 175th Street and Clare Road was selected as an example area for discussing roadway needs and access management. This area was selected due to the number of development proposals being discussed for that area including a

major retail development (see the Lowe's TIS) northwest of the intersection and a warehouse development south and west of the area. This section is intended to provide some level of guidance for providing safe and efficient roadways in that area.

As outlined previously, both 175th Street and Clare Road are proposed as minor arterials. Furthermore, given the projected volumes in this area they should both be assumed to have raised medians with turn-lanes in this area. The build-out speeds are assumed to be ≤45 mph. Full access locations and signals are therefore limited to every ¼ mile (1,280 feet), with directional (left in) access allowed every 660 feet and right-in-right-out (RIRO) access possible somewhat closer (depending on the intersection functional area requirements). These long spacing requirements promote the use of collector roadways for additional site access.

Given the above requirements and the previously completed TIS for the Lowe's development, it is recommended that a single full-access signalized intersection provide the main access on 175th Street between the interchange and Clare Road. This is illustrated in **Figure 7**. In addition, a RIRO access was allowed on the north side of the roadway as shown. A similar RIRO access point could also be considered on the south side of 175th Street, but it should be located approximately 750 feet from the off-ramp and 600 feet prior to the signalized access intersection. Based on the guidelines, no other access points on 175th Street between the interchange and Clare Road should be permitted.

Figure 7: Proposed Access Plan for 175th Street and Clare Road Area

On Clare Road, based on the proposed collector roadway system, the first full connection point would be at the first collector roadway intersection approximately1/4 to 1/3 of a mile south of 175th Street. One directional or RIRO access point would be allowed on either side of the road between this new intersection and 175th Street. Additional full access locations could be provided at 660-foot intervals on the collector roadway. These could be signalized or unsignalized.

The next full-access location on 175th Street east of Clare Road, would be a ¼ mile east of Clare Road. It could be signalized when needed. A directional intersection could be provided between that location and Clare Road as shown. Shared access may be necessary to accommodate all access needs in this area.

While these spacing requirements may appear to be difficult to reconcile with the desired level of access, it is important to remember that these two roads in particular are being planned to carry large volumes of traffic in the future and full access connections (and signals) closer than approximately ¼ mile could impact both traffic flow and safety.

The timing of the roadway improvements necessary in this area will be driven by the land-use types, intensities, and development phasing. Therefore, it is not possible to put specific time frames on when turn lanes or additional through lanes will be needed. However, it is important that the traffic impact studies be used to inform that process and that all needed right-of-way be acquired as the development is approved.